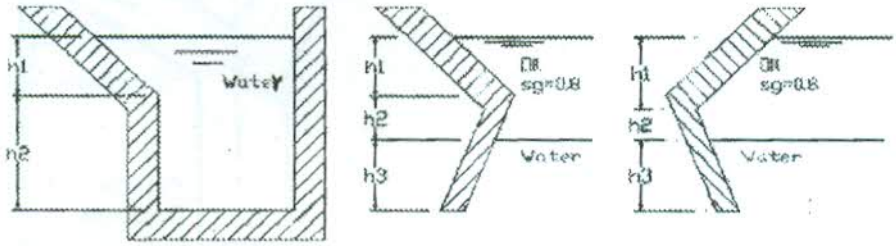
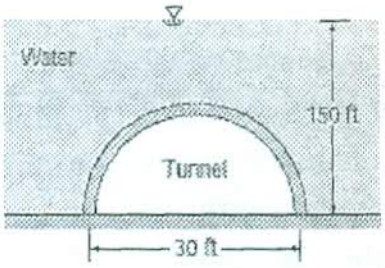
| | | | |
|---|---|---|---|
| Faculty of Engineering at Mataria | HELWAN UNIVERSITY | 1st / 2nd √ | Semester<br>Academic Year 2016/2017 |
| Department: Civil Engineering | | Exam Type: Term Exam | |
| Course Name:<br>**Fluid Mechanics** | | Date of Exam: 21/5/2017 | |
| | | Time Allowed: **3.0 hr**<br>Maximum grade: **90 Marks** | |

| Q1 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (20) |
|---|---|---|---|---|---|

a. Draw the pressure distribution on the hatched walls for the following shapes

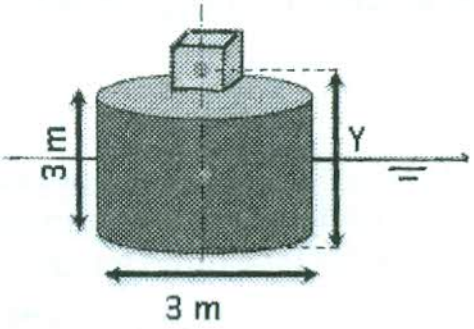



b. A semicircular 30-ft-diameter tunnel is to be built under a 150-ft-deep, 800-ft-long Lake, as shown in Fig. Determine the total hydrostatic force acting on the roof of the tunnel.




| Q2 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (15) |
|---|---|---|---|---|---|

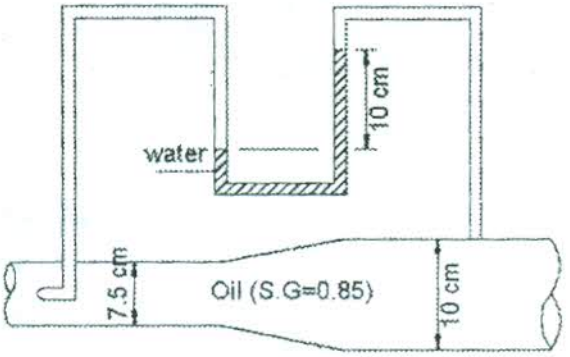
A cylindrical body with diameter of 3.0 m, height of 3.0 m and weight of 5.0 ton is floating over the water surface as shown in figure. If additional weight of 1 ton is placed over the top of the cylindrical body, determine the maximum distance (y) from its center of gravity to the bottom of the cylindrical body to keep the body in stable equilibrium.




| Q3 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (20) |
|---|---|---|---|---|---|

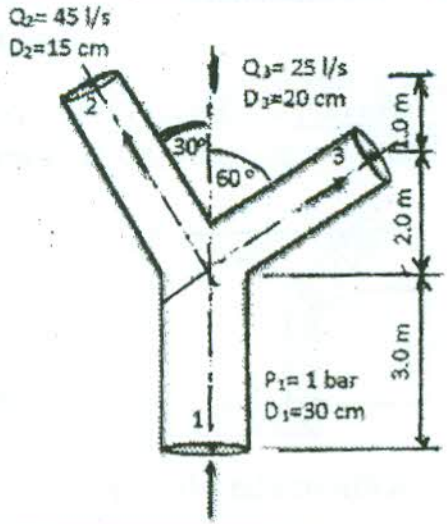
a. Define the following terms and mention the criterion for each:
   - Ideal and real fluid;
   - Steady and unsteady flow;
   - Streamline and its characteristic.

b. Oil of specific gravity 0.85 is flowing in the shown pipe. If all viscous effects are neglected, what is the flow rate (coef. Of discharge =0.95)



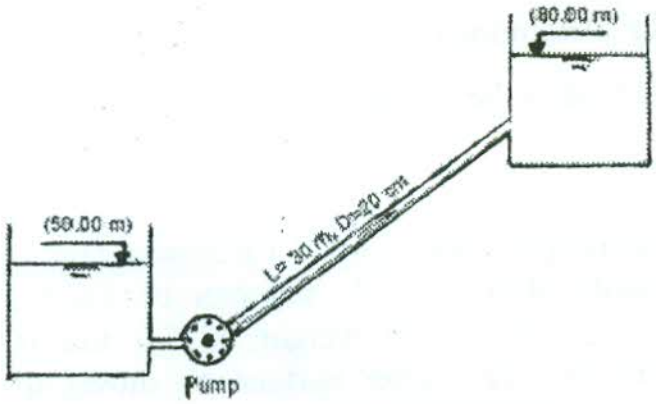
| Q4 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (15) |
|---|---|---|---|---|---|

Find the force required to keep the shown vertical pipe in its position. Neglect the water weight and assume that the head losses between 1, 2 =0.9 velocity head and the head losses between 1, 3 = 1.5 velocity head



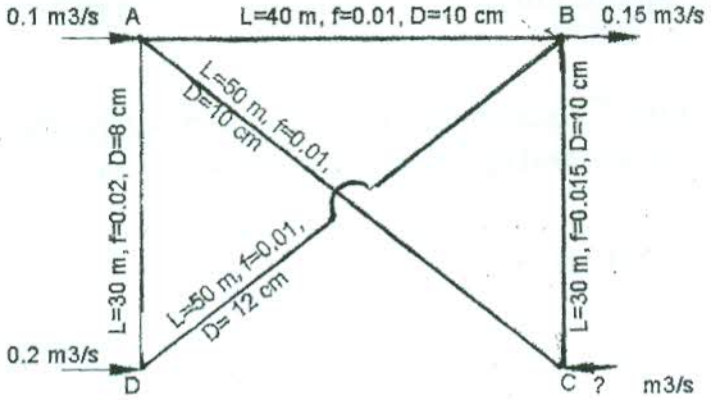

| Q5 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (15) |
|---|---|---|---|---|---|

Water is pumped at 0.157 m3/s from the lower reservoir to the upper reservoir through 20 cm diameter smooth pipe with length 30 m. Assuming pump efficiency =75%, Compute the horsepower required to derive the pump. Sketch the T.E.L




| Q6 | Idea (30)% | Steps (30)% | Calculations (20)% | Final Result (20)% | Mark (15) |
|---|---|---|---|---|---|

The pipe network of two loops as shown in Figure has to be analyzed by the Hardy Cross method for pipe flows for given pipe lengths L and pipe diameters D.

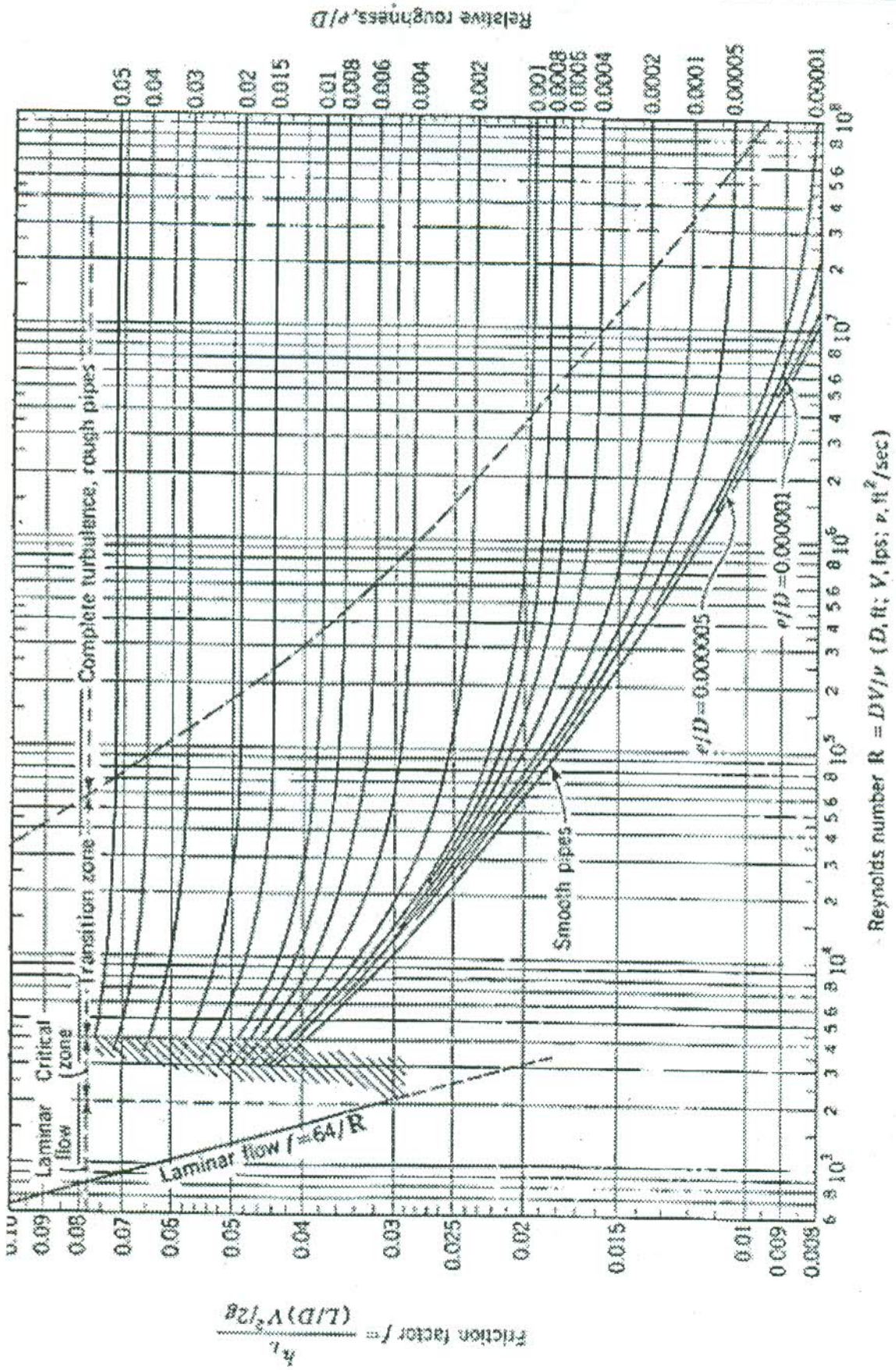



***With Best Wishes***

*Prof. Mohamed Bakr Khalil*

*Ass. Prof. Shokry Abdelaziz*

| | | | |
|---|---|---|---|
| Faculty of Engineering at Mataria | HELWAN UNIVERSITY | 1st | Semester |
| Department: Civil Engineering | | 2nd √ | Academic Year 2016/2017 |
| Course Name: **Fluid Mechanics** | | Exam Type: Term Exam | |
| | | Date of Exam: 21/5/2017 | |
| | | Time Allowed: **3.0 hr** | |
| | | Maximum grade: **90 Marks** | |



| | | | |
|---|---|---|---|
| كلية الهندسة بالمطرية | | | |
| قسم:الهندسة المدنية | | | |
| إسم المقرر:الفوتوجرامتري والاستشعار من بعد | | | |
| أستاذ المادة: دكتور/أحمد سروة | | جامعة حلوان | |
| السنة الدراسية (المستوى): الثانية مدني | | | |
| الفصل الدراسى | الأول | | |
| السنة الأكاديمية 2016/2017 | الثاني√ | | |
| نوع الإمتحان (نصف ترم/ترم): ترم | | | |
| تاريخ الإمتحان:5-2017 | | | |
| زمن الإمتحان :ثلاث ساعات | | | |
| النهاية العظمى: 90 درجة | | | |

ملحوظه: الأسئلة فى (1) ورقات (2) صفحات- تم تصميم الإمتحان اعتمادا على المعايير الدولية للابداع والابتكار

**تنظيم الاجابة في نقاط محددة و جودة الرسومات اثر في تقدير الدرجة. افرض اي بيانات تراها ضرورية. اجب عن الكل**

| س1 | الفكرة (30) % | الخطوات (20) % | الحسابات (30) % | النتيجة النهائية (20) % | الدرجة (15) |
|---|---|---|---|---|---|

1- Draw a sketch to show the main parts of the Aerial Survey Camera?

2- Define the following terms:

Shutter – F number – Diaphram – camera lens – camera filter.

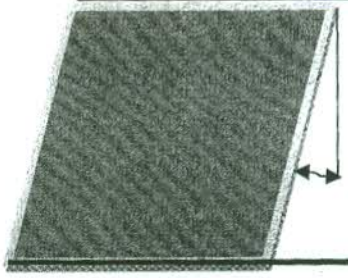
3- The following data were obtained from the camera calibration process. Compute the Equivalent Focal Length (EFL) based on the 7.5 mark and the radial distortion at the remaining angular distances.

| Angle | 7.5° | 15° | 22.5° | 30° | 37.5° | 45° |
|---|---|---|---|---|---|---|
| average measured Distance ( mm ) | 20.223 | 41.164 | 63.643 | 88.706 | 117.866 | 153.535 |

A - Plot the radial distortion curve based on EFL.

B- Compute the Calibrated Focal Length (CFL) and plot its distortion curve for these data.

| س2 | الفكرة (50) % | الخطوات (50) % | الحسابات (0) % | النتيجة النهائية (0) % | الدرجة (15) |
|---|---|---|---|---|---|



منشأ آيل للسقوط وتعذر على مهندسي الانشاءات الاقتراب منه خوفا من انهياره ويراد قياس زاوية ميله على الرأسي كما هو موضح في القطاع الرأسي (Elevation) بالرسم والمطلوب هو ابتكار طريقة من خلال الفوتوجرامتري باستخدام الطائرات الغير مأهولة UAV تمكنك من قياس زاوية الميل الموضحة بطريقة آمنة مع كتابة الخطوات والمعادلات المستخدمة في الحسابات.

| س3 | الفكرة (50) % | الخطوات (30) % | الحسابات (10) % | النتيجة النهائية (10) % | الدرجة (15) |
|---|---|---|---|---|---|

مطلوب تقسيم قطعة ارض مثلثة ABC الشكل الى قسمين متساوين بحيث يمر خط التقسيم بالرأس A علما بأن الارض تنحدر بانتظام بين حدودها الثلاثة لذلك تم تصوير المنطقة جويا بكاميرا بعدها البؤري 155.4 مم وارتفاع طيران 2 كم واخذت الارصاد كما بالجدول:

| النقطة | احداثيات الصورة | | المنسوب |
|---|---|---|---|
| | x مم | y مم | متر |
| A | 4.25 - | 12.25 | 100 |
| B | 21.44 - | 111.59 | 110 |
| C | 50.86 | 30.69 - | 130 |

والمطلوب توقيع نقطة التقسيم وتحديدها **على الصورة** بطريقة دقيقة حتى يتسنى عمل علامة لها في الطبيعة.

| س4 | الفكرة (50) % | الخطوات (0) % | الحسابات (0) % | النتيجة النهائية (50) % | الدرجة (15) |
|---|---|---|---|---|---|

موضح بالرسم جزء من صورة متعددة الاطياف للقمر الصناعي الامريكي LandSat فاذا كان الباند الاول B1 هو الازرق بينما كان الباند الثاني B2 هو الاشعة تحت الحمراء والباند الثالث B3 هو تحت

>>>اقلب الورقة من فضلك 2/1

الفرقة الثانية (ترم ثانى ON) تحليل عددى (عام مدنى)

| Faculty of Engineering at Helwan | | 2nd Semester-2nd Year Civil Engineeing Academic Year 2016/2017 |
|---|---|---|
| Department: Phys. & Eng. Math. | | |
| Course Name: Mathematics 3 | HELWAN UNIVERSITY | Date of Exam:24th May 2017 |
| | | Time Allowed: 3 Hours |
| Exam: Final Term | | Maximum Mark: 70 |

*NOTES: For all questions: Idea (30)%, Steps (20)%, Calculations 40%, Final Result (10)% of the total mark.*

**Question #1 (9 + 9 marks)**

**a)** Find the highest possible Lagrange's polynomial representing the following data

| $x$ | 0 | 1 | 2 | 5 |
|---|---|---|---|---|
| $f(x)$ | 2 | 3 | 12 | 147 |

Then find $f(4)$ and $f'(4)$.

**b)** Use the NFDDF to Find the highest possible interpolating polynomial representing the following data

| $x$ | $-1$ | 0 | 0.5 | 1 | 2.5 | 3 |
|---|---|---|---|---|---|---|
| $f(x)$ | 3 | $-2$ | $-0.375$ | 3 | 16.125 | 19 |

Then find $f(0.5)$ and $f'(0.5)$.

**Question #2 (9 + 8 marks)**

**a)** Use the composite Simpson's formula to find an approximate value of

$$\int_{2}^{2.3} \frac{1}{x}\, dx$$

within an accuracy $10^{-8}$ where $E_{Simp} = \frac{(b-a)}{180} h^4 \max_{a\le x\le b} |f''''(x)|$.

**b)** Use the Gauss two points formula to find an approximate value of $\int_0^1 e^{x^2}\, dx$.

**Question #3 (10 + 10 marks)**

| $x_n$ | 1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| $y_n$ | 1 | | | | | | |

**a)** Use the modified Euler's method (2nd order Runge-Kutta) to complete the data values for $y_n$ (correct to 4 decimal places) in the above table if $y(1) = 1$ and

$$y' = xy^2 - \frac{y}{x}$$

*P.T.O.*

**b)** Use the least square method to fit the above complete table into the equation

$$y = \frac{1}{ax^2 + bx + c}$$

***Question #4 (5 + 10 marks)***

Find the approximate value of $y(0.2)$ correct to 4 decimal places if

$$y'' + xy' + y = 0, \quad y(0) = 1, \quad \text{and} \quad y'(0) = 2$$

with step size $h = 0.1$ using:

**a)** the Euler's method.

**b)** the 4th order Runge-Kutta method.

---

*With our best wishes:* *Dr. Ahmed Yehia* *Dr. Khaled M. Abdelgaber* *Dr. Emad Abdallah*

الفرقة الثانية
ترم ثانى ٢٠١٧

ميكانيكا التربة
م. مدنى

| Helwan University<br>Fac. of Eng., Mattaria<br>Civil Eng. Department | Soil Mechanics<br>2nd Year Civil | Year 2016-2017<br>Time: 3.0 hrs. |
|---|---|---|

**Question #1 (10%):** The water table, in an 8 m thick silty sand deposit, is at a depth of 3 m below the ground level. The entire soil above the water table is saturated by capillary water and the saturated unit weight is 1.88 t/m$^3$. Plot the variation of the total and effective vertical stresses and the pore water pressure with depth.

## Question #2 (20 %)

**(a)** A clay layer had been subjected to stress of 10 t/m$^2$. Two years after load application, the excess pore water pressure was measured to be 3 t/m$^2$ at the middle of the layer. Assuming that the distribution of the excess pore water pressure is parabolic; sketch the isochrone and find the average degree of consolidation after two years. Estimate the coefficient of consolidation of this layer if the clay layer thickness is 5 m.

| U% | 20 | 30 | 40 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|
| Tv | 0.031 | 0.071 | 0.126 | 0.287 | 0.403 | 0.567 |

**(b)** A 4m thick clay layer with over consolation ratio of 4 and effective overburden pressure of $\sigma_o$ had been subjected to a stress increases of 3 $\sigma_o$. Find the final settlement of the layer assuming that $C_c$= 0.4, $C_r$ = 0.08 and initial void ratio of 0.80. Final also the final void ratio at the end of the consolidation stage.

## Question # 3 (20%)

**(a)** A Flexible square footing with dimension B*B is resting on a sand layer with great depth and modulus E. The estimated settlement of the footing centre is S. Find the settlement of the footing centre in terms of S for the following cases:

1- Increase of the footing dimensions to 2B*2B.
2- Increase of the footing dimensions to B*10 B.
3- Considering the footing is rigid with dimension B*B.
4- Considering athe footing is circular with diameter B and is flexible.

| قيم معامل الشكل والجساءة ( I ) | | | | الشكل والجساءة |
|---|---|---|---|---|
| المتوسط | محيط الدائرة أومنتصف الحرف الطويل للمستطيل | الركن | المركز | |
| ٠,٨٥ | ٠,٦٤ | – | ١,٠٠ | دائرة – مرن |
| ٠,٧٩ | ٠,٧٩ | – | ٠,٧٩ | دائرة – جسيء |
| ٠,٩٥ | ٠,٧٦ | ٠,٥٦ | ١,١٢ | مربع – مرن |
| ٠,٨٢ | ٠,٨٢ | ٠,٨٢ | ٠,٨٢ | مربع – جسيء |
| | | | | مستطيل – مرن |
| ١,٣٠ | ١,١٢ | ٠,٧٦ | ١,٥٣ | L/B = 2 |
| ١,٨٢ | ١,٦٨ | ١,٠٥ | ٢,١٠ | = 5 |
| ٢,٢٤ | ٢,١٠ | ١,٢٨ | ٢,٥٦ | = 10 |
| | | | | مستطيل – جسيء |
| ١,١٢ | ١,١٢ | ١,١٢ | ١,١٢ | L/B = 2 |
| ١,٦٠ | ١,٦٠ | ١,٦٠ | ١,٦٠ | = 5 |
| ٢,٠٠ | ٢,٠٠ | ٢,٠٠ | ٢,٠٠ | = 10 |

## Question #4 (20%)

**(a)** Differentiate between each of the following:

i) Consolidation and compaction

(ii) The stander Proctor test and the modified Proctor test.

**(b)** Standard proctor tests have been carried out on a group of soil samples and the following data were obtained:

| Water content $W_c$ % | 10.86 | 14.34 | 15.48 | 21.62 | 25.00 |
|---|---|---|---|---|---|
| Bulk unit weight $\gamma_b$ t/m$^3$ | 1.667 | 1.832 | 1.926 | 1.992 | 1.934 |

- Plot the water content $W_c$ - $\gamma_{dry}$ curve and find the maximum dry density and the optimum water content.
- Find the void ratio, porosity and degree of saturation at the maximum dry density and optimum water content.
- Find water content required to saturate the soil (full saturation condition) at its maximum dry density.

- If the relative compaction is required to be not less than 95%, find the minimum required water content to achieve the field requirements.
- Sketch on the same graph, which you have drawn, the expected compaction curve for the modified Proctor test.

## Question # 5 (25%)

**(a, 10% )** Write whether the following statements are true or false.

1) The origin and the pole are the same point in a Mohr circle.
2) On the failure plane, the shear stress is maximum.
3) The Mohr circle can be drawn for all intermediate loadings in a shear box test.
4) According to Mohr's theory, the failure envelope is a strength line.
5) The shear strength of a soil depends upon the total stresses.
6) The Mohr circle for unconfined compression test passes through the origin.
7) Consolidated drained test is also known as slow test.
8) Consolidated undrained test on sand can be conducted easily in a direct shear machine.
9) The dense sand increases in volume during shear.
10) At critical void ratio, the volume change during shear is maximum.

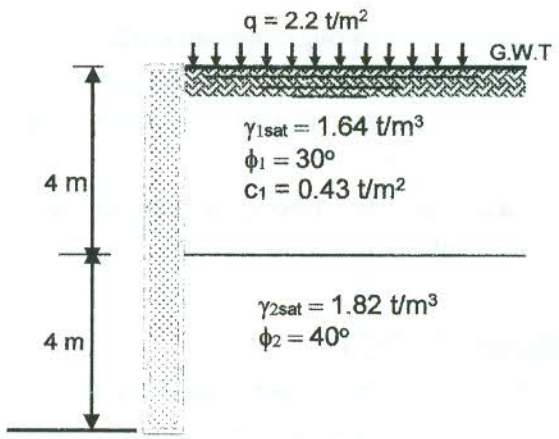
**(b, 15 %)** The results of three consolidated-undrained triaxial tests on identical specimens of a particular soil are as shown in the below table. It is required to find:

i) The total and effective shear strength parameters.
ii) What should be the expected pore pressure at failure for a test with a confining stress ($\sigma_3$) of 100 kPa?

| Test no. | Confining stress (kPa) | Peak deviatoric stress (kPa) | Pore water pressure at peak (kPa) |
|---|---|---|---|
| 1 | 200 | 244 | 55 |
| 2 | 300 | 314 | 107 |
| 3 | 400 | 384 | 159 |

## Question #6 (15%)

a) For the shown retaining wall with smooth vertical back, use Rankin's theory to determine:
   i) The active earth pressure distribution on the wall,
   ii) The magnitude and the point of application of the resultant earth pressure force acting on the wall.




***You may assume and data you need***

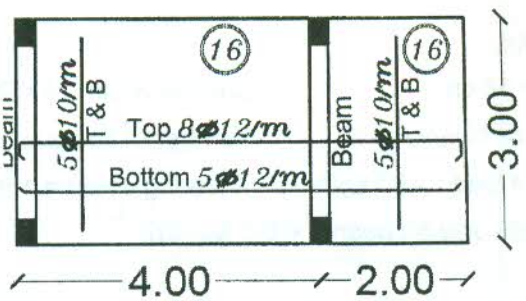
Good Luck

| | | | | |
|---|---|---|---|---|
| **Helwan University** | | **Semester** | **1 st** | **2 nd √** |
| **Faculty of Engineering - Mataria** | **HELWAN UNIVERSITY** | **Academic Year** | **2016/2017** | |
| **Department: Civil Engineering** | | **Exam Type: Final Term Exam** | | |
| **Reinforced Concrete (1 – A)** | | **Date of Exam: May, 17th 2017** | | |
| **Course Code: CV-4211-A** | | **Time Allowed: 3 Hours** | | |
| **Second Year** | | **Maximum Mark: 100 points** | | |

NOTE: Answer the following questions - **Exam is (one) paper (two) pages**
For all questions assume $f_{cu}$=250 kg/cm² and $f_y$= 3600 kg/cm²

**Question 1: (15 points)**

The plan shows the reinforcement of an existing slab, It is required to calculate the total deflection at the slab cantilever edge.




Data:

$t_s$ = 16 cm No walls

Live load = 500 kg/m²

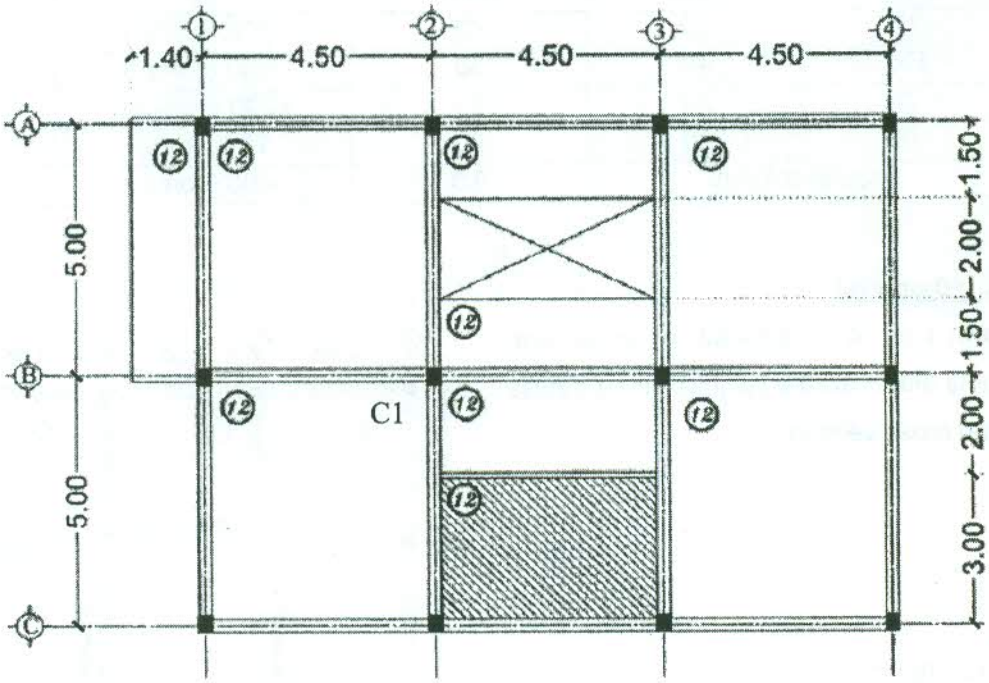
Flooring cover = 150 kg/m²

**Question 2: (35 points)**

It is required to design and draw reinforcement details for the slabs in the shown plan with scale 1:50.

Data:

$t_s$ = 12 cm Live load = 300 kg/m² Flooring cover = 200 kg/m²




**Plan 1**

**Question 3: (25 points)**

a- **In plan 1** Check the safety of the **unbraced** column C1 which has dimension 60 cm x 60 cm, and reinforcement 18 bars of 16 mm diameter and the applied load from one floor is 50 ton. (10 %)

Number of floors = 6 Floor height = 4 m All beams = 25 × 70

| | | | |
|---|---|---|---|
| Helwan University | HELWAN UNIVERSITY | Semester | 1 st / 2 nd √ |
| Faculty of Engineering - Mataria | | Academic Year | 2016/2017 |
| Department: Civil Engineering | | Exam Type: Final Term Exam | |
| Reinforced Concrete (1 – A) | | Date of Exam: May, 17th 2017 | |
| Course Code: CV-4211-A | | Time Allowed: 3 Hours | |
| Second Year | | Maximum Mark: 100 points | |

b- **In plan 2** of an **unbraced** building, it is required to **design** the **columns** under vertical loads only and **draw** section reinforcement details with scale 1:10.

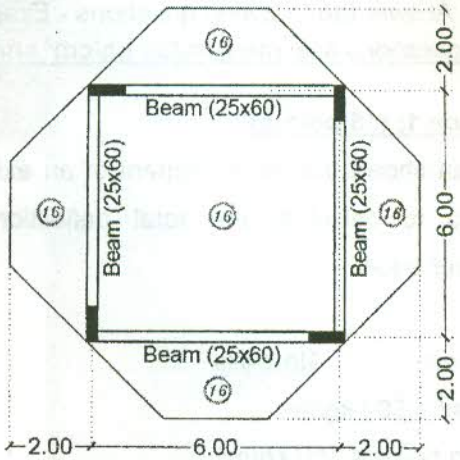
Data:

$t_s$ = 16 cm — Column width (b) = 25 cm

Floor height = 4 m — Number of floors = 7

Live load = 200 kg/m² — Flooring cover = 150 kg/m²

Walls only on beams = 0.5 $h_w$ t/m




**Plan 2**

**Question 4: (25 points)**

Get the missing data for the given sections and draw section reinforcement details with suitable scale:

| Column | Length (a) (cm) | Width (b) (cm) | Moment ($M_u$) (m.t) | Axial force ($N_u$) (t) | Steel ($A_s$) ($cm^2$) |
|---|---|---|---|---|---|
| 1 | ?? | 30 | 40 | -200 (comp.) | ?? |
| 2 | 100 | 40 | 30 | -400 (comp.) | ?? |
| 3 | ?? | 30 | 50 | +200 (tension) | ?? |
| 4 | 70 | 30 | 20 | ?? (comp.) | 14#18 |
| 5 | Spiral column | | 0.0 | -400 (comp.) | ?? |

**Question 5: (10 points)**

For the shown plan, it is required to design one paneled beams and draw the reinforcement details (Elevation and cross section)

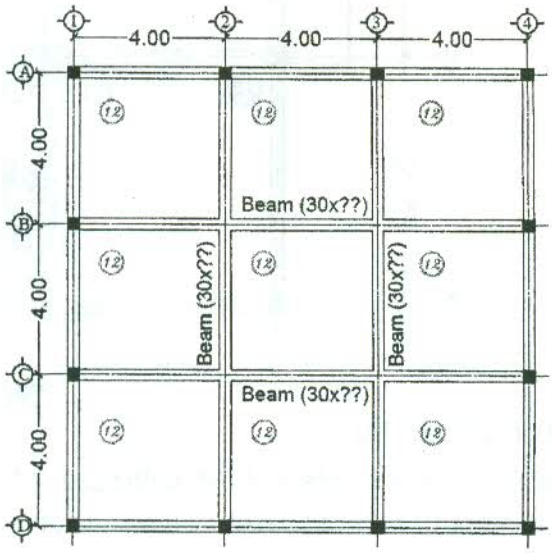
Data:

$t_s$ = 12 cm

No walls

Live load = 300 kg/m²

Flooring cover = 150 kg/m²




**Best Wishes** ***Dr. Moustafa Osman***

## Equivalent load for design of beams (supporting two way slabs):

| L/2x | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.70 | 1.80 | 1.90 | 2.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| α | 0.667 | 0.725 | 0.769 | 0.803 | 0.819 | 0.853 | 0.870 | 0.885 | 0.897 | 0.908 | 0.917 |
| β | 0.500 | 0.544 | 0.582 | 0.615 | 0.642 | 0.667 | 0.688 | 0.706 | 0.722 | 0.737 | 0.750 |

## α and β Values for Solid Slabs:

| r | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.70 | 1.80 | 1.90 | 2.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| α | 0.35 | 0.40 | 0.45 | 0.50 | 0.55 | 0.60 | 0.65 | 0.70 | 0.75 | .80 | .85 |
| β | 0.35 | 0.29 | 0.25 | 0.21 | 0.18 | 0.16 | 0.14 | 0.12 | 0.11 | 0.09 | 0.08 |

## α and β According to Grashoff. (Paneled beam):

| r | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.70 | 1.80 | 1.90 | 2.00 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| α | 0.500 | 0.595 | 0.672 | 0.742 | 0.797 | 0.834 | 0.869 | 0.893 | 0.914 | 0.928 | 0.941 |
| β | 0.500 | 0.405 | 0.328 | 0.258 | 0.203 | 0.166 | 0.131 | 0.107 | 0.086 | 0.072 | 0.059 |

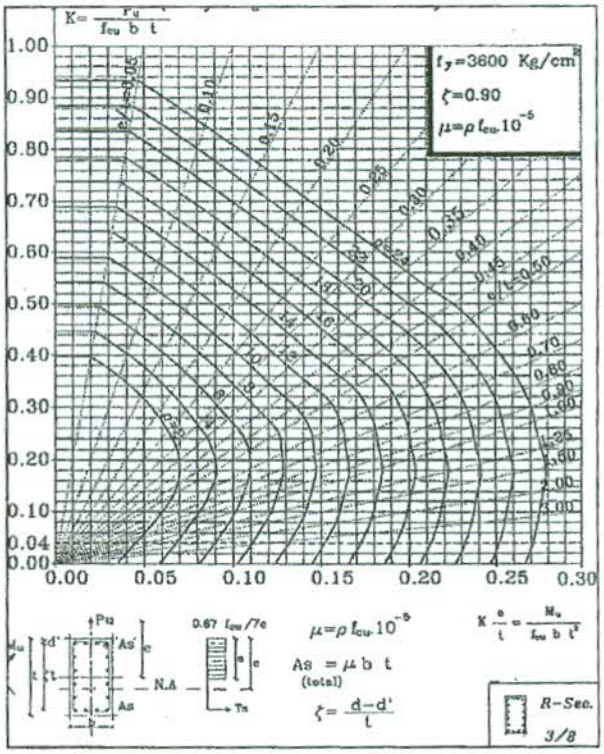
**Steel Bars Diam.**

| Φ mm | Area $cm^2$ |
|---|---|
| 10 | 0.785 |
| 12 | 1.13 |
| 14 | 1.54 |
| 16 | 2.01 |
| 18 | 2.54 |
| 20 | 3.14 |
| 22 | 3.80 |

**Value of factor β:**

| $\frac{Pu}{(Fcu \cdot b \cdot t)}$ | β |
|---|---|
| ≤0.2 | 0.80 |
| 0.3 | 0.75 |
| 0.4 | 0.70 |
| 0.5 | 0.65 |
| ≥0.6 | 0.60 |

| C/a | C1 | J |
|---|---|---|
| 0.1250 | 4.854 | 0.828 |
| 0.1375 | 4.640 | 0.821 |
| 0.1500 | 4.455 | 0.817 |
| 0.1625 | 4.291 | 0.813 |
| 0.1750 | 4.146 | 0.808 |
| 0.1875 | 4.016 | 0.804 |
| 0.2000 | 3.899 | 0.800 |
| 0.2125 | 3.793 | 0.795 |
| 0.2250 | 3.697 | 0.791 |
| 0.2375 | 3.608 | 0.786 |
| 0.2500 | 3.526 | 0.782 |
| 0.2625 | 3.451 | 0.778 |
| 0.2750 | 3.381 | 0.773 |
| 0.2875 | 3.316 | 0.769 |
| 0.3000 | 3.255 | 0.765 |
| 0.3125 | 3.199 | 0.760 |
| 0.3250 | 3.146 | 0.756 |
| 0.3375 | 3.096 | 0.752 |
| 0.3500 | 3.049 | 0.747 |
| 0.3625 | 3.004 | 0.743 |
| 0.3750 | 2.963 | 0.739 |
| 0.3875 | 2.923 | 0.734 |
| 0.4000 | 2.888 | 0.730 |
| 0.4125 | 2.850 | 0.726 |
| 0.4250 | 2.816 | 0.721 |
| 0.4375 | 2.784 | 0.717 |
| 0.4500 | 2.753 | 0.713 |
| 0.4625 | 2.724 | 0.708 |
| 0.4750 | 2.696 | 0.704 |
| 0.4875 | 2.670 | 0.700 |
| 0.5000 | 2.645 | 0.695 |

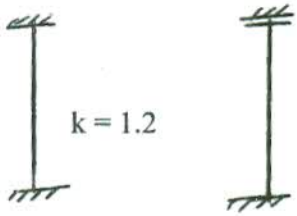



$$Pb = 2144 \times \left(\frac{fcu}{6000 + f_y / \gamma s}\right) bd \quad kg$$

$$I_e = \left(\frac{M_{cr}}{M_a}\right)^3 . I_g + \left[1 - \left(\frac{M_{cr}}{M_a}\right)^3\right] . I_{cr}$$

**For unbraced columns**

λ< 10 short column 10 < λ < 23 long column




**Spiral columns**

$Pu = 0.35\ f_{cu}\ A_k + 0.67\ f_y\ A_s + 1.38\ f_{yp}\ V_{sp}$

$Pu = 0.4\ f_{cu}\ A_c + 0.76\ f_y\ A_s$

$$V_{sp} = \frac{\pi \times A_{sp} \times D_k}{P} \qquad V_{sp\,min} = \left(0.36 \frac{f_{cu}}{f_{yp}} \left(\frac{D_c^{\,2}}{D_k^{\,2}} - 1\right)\right) A_c$$

الفرقة الثانية
الترم الثاني ٢٠١٧

تحليل أنشائي (2) ب
صدفي

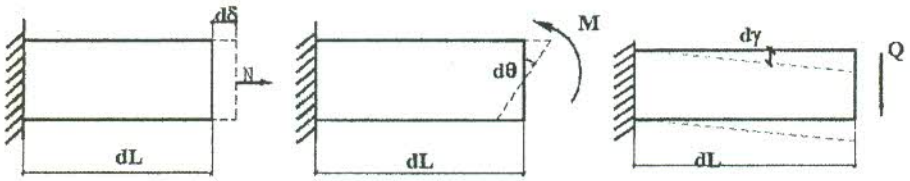
**HELWAN UNIVERSITY**
**FACULTY OF ENGINEERING**
**CIVIL ENGINEERING DEPARTMENT**

**STRUCTURAL ANALYSIS**
2nd Year - 2nd Term- May 2017
3 hours

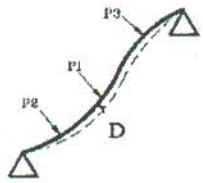
**Unless otherwise mentioned, assume : EA= 10000TON , EI =30000T/cm$^2$, ($\alpha$= 1x10$^{-6}$ )**

## P1 - (20%)

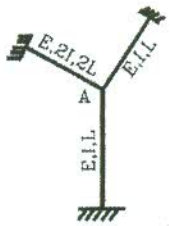
a- What is the values of dδ, dθ and dγ due to normal N , M and Q
b- Determine the displacement **D** in terms of N,M and Q using the concept of EXT. work=INT. work
c- Determine the moment required to rotate one end of a member fixed from the other end an angle equals to 3 rad, in terms of E, L and I.?
d- Explain briefly the application of moment distribution method in frames with sway.
e- How can you reduce the deflection of a concrete beam in a building?
f- How can you reduce the effect of temperature change in a continuous beam?
g- Determine the moment require to rotate joint A an angle of 0.01 rad.
h- The 3-moment equation method can be applied in continuous beams if one member has variable inertia within its length. True or False ( correct if false)



P1-a



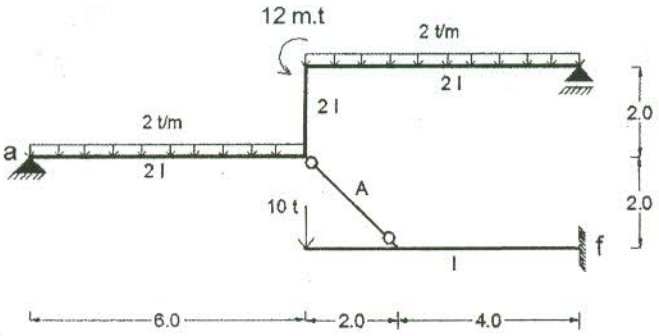
P1-b



P1-g

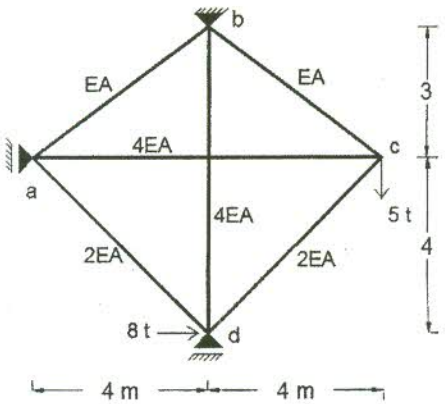
## P2 - (20%)

Use the method of consistent deformation to draw the bending moment of the shown frame due to the shown **loads** in addition to a rotation at joint **(f) = 0.02 rad clockwise** and **settlement at (a) = 5 cm.** (I=500,000 cm$^4$, A =1000 cm$^2$)



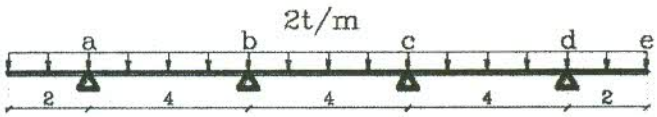

## P3 - (25%)

Determine the normal force in all members of the shown truss due to the shown **loads** and **error in fabrication of all members of 10 mm shorter** and **change in temperature = +30°C**.



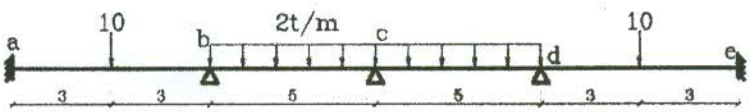

## P4 - (20%)

Draw the BMD and SFD for the shown beam due to the shown **load** and **settlement at joint (b) = 5 cm** using the method of three moment equation.




## P4 - (25%)

Use the moment distribution method to draw the bending moment diagram of the shown beam.
(FEM= WL$^2$/12, PL/8)




مع تمنياتنا بتمام التوفيق لكم جميعا
استاذ دكتور مدحت كمال
دكتورة نهال مجدي